

# James M. Rosado

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## Summary

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Applied Research Mathematician and Software Developer with over a decade of experience spanning academic research, national security, and computational neuroscience. Holds active Top Secret/SCI clearance and a Ph.D. in Mathematics from Temple University. Proven expertise in mathematical modeling, algorithm design, high-performance computing, and AI/ML systems integration using Python, C/C++, MPI, and OpenMP. Demonstrated success delivering impactful software across government and academic sectors, including VR-based neuron simulations, graph-based query systems, and machine learning recommendation engines. Recognized with multiple awards for software engineering excellence at the NSA. Published author in leading journals and contributor to open-source neuroscience tools. Experienced educator and mentor with a commitment to innovation, cross-disciplinary collaboration, and scientific communication.

## Education

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Temple University, Ph.D. in Mathematics	Sep. 2017 – June 2022
Rowan University, M.A. in Mathematics	Sep. 2012 – June 2016
NJ Department of Education, Teacher of Mathematics Certificate	Sep. 2008 – Sep. 2009
Rutgers University, B.S. in Electrical and Computer Engineering	Sep. 2003 – June 2007
Pitman High School, High School Diploma	Sep. 1999 – June 2003

## Experience

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**Applied Mathematician**, U.S. Government / Department of Defense / NSA – Maryland, USA Sep. 2022 – Present

- Conducts applied research and software development across various NSA branches with active TS/SCI clearance
- Developed graph-based query algorithms; collaborated with LLNL on integration with in-house software
- Built ML-based article recommendation systems using Python, Scikit-learn, TensorFlow, and PyTorch
- Received multiple agency awards for software engineering and machine learning work

**Graduate Mathematics Intern**, NSA Graduate Mathematics Program – Maryland, USA Summer 2021

- Researched detection of synthesized speech using bispectrum analysis and topological data analysis
- Implemented and evaluated binary classifiers and neural networks for speech classification
- Co-authored internal paper and briefed findings to NSA leadership including the Director

**Researcher**, Center for Computational Mathematics & Modeling (C2M2), Temple University – Philadelphia, PA Sep. 2019 – Sep. 2022

- Developed Neuro-VISOR, a real-time VR simulation platform for neuronal networks using C#, Unity, and PDE solvers
- Created Python mesh generation software using parallel transport and 1D neuronal geometries
- Enabled real-time interaction of synaptic and electrical behavior in virtual environments used in classrooms

**Researcher**, Queisser Research Group, Temple University – Philadelphia, PA Sep. 2018 – Sep. 2022

- Developed HPC pipelines using MPI, FEM/FVM methods for calcium simulations under TMS
- Ran large-scale simulations on SDSC EXPANSE/COMET through NSF XSEDE awards (over 1.8M core-hours)
- Mentored students and collaborated across Temple, University of Minnesota, and University of Freiburg

**Graduate Teaching Assistant**, Temple University – Philadelphia, PA Sep. 2017 – June 2022

- Instructed undergraduate mathematics courses, designed exams, and mentored students in research
- Volunteered for MCC tutoring and led SIAM workshops and student research talks

- Adjunct Professor**, Rowan University – Glassboro, NJ Sep. 2016 – June 2017
- Taught evening Calculus I courses and maintained active student engagement through Canvas
  - Designed and graded assessments; provided regular student support and feedback
- Adjunct Professor (Online)**, Rowan University – Glassboro, NJ Sep. 2024 – Dec. 2024
- Administered and online mathematics course
  - Designed and graded assessments; provided regular student support and feedback via Canvas
- Adjunct Professor**, Towson University – Towson, MD Jan. 2025 – May 2025
- Taught an evening course in elementary mathematics
  - Designed and graded assessments; provided regular student support and feedback via Blackboard
- High School Mathematics Teacher**, Clearview Regional School District – Mullica Hill, NJ Sep. 2009 – June 2017
- Taught 9th–12th grade math, co-taught special education classes, and led night/homebound instruction
  - Developed interactive lessons aligned with NJ Core Content Standards and IEP accommodations
- Mathematics Researcher**, Rowan University – Glassboro, NJ Sep. 2012 – June 2016
- Developed and published finite frame partitioning algorithms using Mathematica and complex analysis
  - Presented work at the Joint Mathematics Meetings (JMM) and STEM symposia
- Private Tutor**, Gloucester County, NJ Sep. 2011 – June 2016
- Delivered one-on-one instruction from grade school through high school mathematics
  - Coordinated with parents and used manipulatives to reinforce student understanding

## Publications

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- Neuronal Resilience and Calcium Signaling Pathways in the Context of Synapse Loss and Calcium Leaks** Dec 2023  
 Rosado, J. M., Borole, P. R., Neal, M., Queisser, G.  
 SIAM Journal on Applied Mathematics, Vol. 83, Issue 6, pp. 2418–2442
- Multi-scale Modeling Toolbox for Single Neuron and Subcellular Activity Under TMS** Nov 2021  
 Rosado, J. M., Shirinpour, S., Hananeia, N., Tran, H., Galanis, C., Vlachos, A., Jedlicka, P., Queisser, G., Opitz, A.  
 Brain Stimulation, Vol. 14, Issue 6, pp. 1470–1482
- Calcium Modeling of Spine Apparatus-containing Human Dendritic Spines** Apr 2022  
 Rosado, J. M., Bui, V. D., Haas, C. A., Beck, J., Queisser, G., Vlachos, A.  
 PLOS Computational Biology, April 2022
- Partitions of Equiangular Tight Frames** Mar 2017  
 Rosado, J. M., Nguyen, H. D., Cao, L.  
 Linear Algebra and its Applications, Vol. 526, pp. 95–120
- A Table of Definite Integrals from the Marriage of Power and Fourier Series** Aug 2015  
 Rosado, J. M., Osler, T.  
 Scientia, Vol. 26, pp. 77–82
- Ultrastructural Neuronal Modeling of Calcium Dynamics Under TMS** (Doctoral Dissertation) May 2022  
 Rosado, James Michael  
 Temple University Libraries
- Partitions of Finite Frames** (Master's Thesis) June 2016  
 Rosado, James Michael

## Projects

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<b>Neuro-VISOR: Virtual Interactive Simulation of Reality</b> Developed at Temple University's C2M2 Lab for real-time VR simulation of neuronal dynamics. <a href="https://github.com/c2m2/Neuro-VISOR">github.com/c2m2/Neuro-VISOR</a>	2018 – 2022
<b>NeMo-TMS: Neuron Modeling for TMS</b> Multi-scale modeling toolbox to simulate transcranial magnetic stimulation effects on neurons. <a href="https://github.com/OpitzLab/NeMo-TMS">github.com/OpitzLab/NeMo-TMS</a>	2018 – 2019
<b>CalcSim: Calcium Dynamics Simulator</b> MATLAB-based simulator for modeling intracellular calcium dynamics in single neurons. <a href="https://github.com/NeuroBox3D/CalcSim">github.com/NeuroBox3D/CalcSim</a>	2021 – 2023
<b>PythonNeuronMeshes</b> Python software for generating surface meshes from 1D neuron morphology using parallel transport methods. <a href="https://github.com/jarosado0911/PythonNeuronMeshes">github.com/jarosado0911/PythonNeuronMeshes</a>	2022 – Present

## Technologies

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**Languages:** C++, C, Python, Java, C#, MATLAB, LUA, Shell scripting, LaTeX

**Technologies:** Unity3D, Git, GitHub, GitLab, Atlassian Bitbucket, MPI, OpenMP, Blackboard, Canvas, PowerSchool, PowerTeacher

**Libraries & Frameworks:** TensorFlow, PyTorch, Scikit-learn, word2vec, uG4 (unstructured grid framework)

**Tools:** Zoom, Skype, Geometer's Sketchpad, TI-84 Graphing Calculator

**Operating Systems:** Linux (RedHat, CentOS), macOS, Windows

## Awards

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### DoD/NSA Awards:

2025 Monetary Award – For contributing to improved software performance - \$2,000  
2024 Monetary Award – For developing and implementing article recommendation systems - \$3,000  
2024 Performance Coin Award – For work completed on ML-based recommendation systems  
2023 Time Off Award – For advanced coding practices in software engineering - 16 hrs.  
2023 Monetary Award – For performance involving advanced query-based algorithms - \$2,000

### National Science Foundation HPC Awards:

2022 XSEDE Compute Research Award – \$2,440  
2021 XSEDE Compute Research Award – \$2,440  
2020 XSEDE Compute Research Award – \$12,873

### Temple University Awards:

Mar. 2022 Dissertation Completion Grant – \$8,750  
May 2020 First Summer Research Initiative Award – \$6,000  
May 2022 Jay Novik Graduate Student Fellowship – \$5,000 for exceptional performance in the Graduate Mathematics Program  
Summer 2019 NIH Brain Initiative Summer School Funding Award  
Jan. 2019 Mathematics Department Excellence in Teaching Award – \$500  
Nov. 2018 SIAM Recognition – Leadership and coordination of SIAM Chapter activities

### Rowan University Awards:

2015–2016 Certificate of Achievement in Mathematics – For JMM participation and publishing  
2014–2015 Certificate of Achievement in Mathematics – For JMM participation

## Rutgers University Awards:

2003–2007 Edward J. Bloustein Distinguished Scholar

## Presentations

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June 2022 — “*Ultrastructural Neuronal Modeling of Calcium Dynamics Under Transcranial Magnetic Stimulation*”, Doctoral Defense, Temple University, Philadelphia, PA

Oct. 2021 — “*Neuron Dendritic Spines: Modeling Calcium Communication*”, CST Research Mixer, Temple University, Philadelphia, PA

May 2021 — “*Hodgkin-Huxley Conductance Based Model: From 1D to 3D*”, Numerical PDEs Course, Temple University, Philadelphia, PA

Jan. 2021 — “*Applied Mathematics: Modeling Neuronal Electrical and Ion Dynamics*”, Temple University, Philadelphia, PA

Dec. 2020 — “*PDE Based Image Reconstruction*”, Numerical PDEs Course, Temple University, Philadelphia, PA

Nov. 2020 — “*Modeling an Action Potential and Neuronal Behavior*”, Graduate Seminar, Temple University, Philadelphia, PA

Jan. 2020 — “*An Investigation of Spine to Dendrite Calcium Communication*”, Applied Mathematics Seminar, Temple University, Philadelphia, PA

Oct. 2019 — “*Inner Workings of a Neuron: A Mathematical Perspective*”, Temple University Math Club, Philadelphia, PA

May 2019 — “*A Walk Through Calculus of Variations*”, Methods in Applied Mathematics Course, Temple University, Philadelphia, PA

Dec. 2018 — “*Sturm-Liouville Theory: An Example*”, Methods in Applied Mathematics Course, Temple University, Philadelphia, PA

March 2018 — “*A Table of Definite Integrals from the Marriage of Power and Fourier Series*”, EPaDel Spring Section Meeting, Philadelphia, PA (with T. Osler)

Fall 2017 — “*Partitions of Equiangular Tight Frames*”, Graduate Student Seminar, Temple University, Philadelphia, PA

Jan. 2017 — “*Partitions of Equiangular Tight Frames*”, Joint Mathematics Meeting, Atlanta, GA (with H. Nguyen and L. Cao)

May 2016 — “*Partitions of Equiangular Tight Frames*”, STEM Symposium, Rowan University, Glassboro, NJ (with H. Nguyen and L. Cao)

April 2016 — “*Frame Partitioning Algorithms*”, Master’s Thesis Presentation, Rowan University, Glassboro, NJ

May 2015 — “*A Table of Definite Integrals from the Marriage of Power and Fourier Series*”, STEM Symposium, Rowan University, Glassboro, NJ (with T. Osler)

Aug. 2015 — “*A Table of Definite Integrals from the Marriage of Power and Fourier Series*”, MAA Mathfest, Washington, D.C. (with T. Osler)

May 2015 — “*A Table of Definite Integrals from the Marriage of Power and Fourier Series*”, Sigma Xi Research Symposium, St. Joseph’s University, Philadelphia, PA (with T. Osler)

Jan. 2015 — “*A Table of Definite Integrals from the Marriage of Power and Fourier Series*”, Joint Mathematics Meeting, San Antonio, TX (with T. Osler)

## Undergraduate Research

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**Undergraduate Engineering Research**, College of Engineering, Rowan University – Summer 2005  
Glassboro, NJ

- Designed transistor-based replica of leech heart interneuron
- Modeled system using Hodgkin-Huxley formalisms for circuit-based neuron simulation
- Investigated FPGA experimentation using Mentor Graphics Advantage software

**Undergraduate Research**, College of Humanities and Social Sciences, Rowan University – Glassboro, NJ June 2000 – June 2003

- Conducted archaeological conservation at the Museum of La Serena, Chile
- Designed a statistical program to estimate human stature from archaeological remains
- Participated in archaeological site mapping and international research collaboration

**Undergraduate Research (Abroad)**, Universidad Catolica del Norte – Coquimbo, Chile

June 2004

- Translated and analyzed ChemCAD software for shellfish cultivation system design
- Studied the aquacultural processes for farming and harvesting shellfish

## Professional Affiliations

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Sep. 2018 – June 2022 — Temple University SIAM Chapter President  
Sep. 2018 – June 2022 — Temple University SIAM Chapter Member  
Sep. 2018 – June 2022 — Society for Industrial and Applied Mathematics (SIAM) Member and Journal Subscriber  
Sep. 2017 – June 2022 — American Mathematical Society (AMS) Member  
Sep. 2017 – June 2022 — Mathematical Association of America (MAA) Member  
Sep. 2015 – June 2017 — Rowan University Pi Mu Epsilon Chapter Member  
Sep. 2015 – June 2017 — Pi Mu Epsilon National Mathematics Honor Society Member  
Sep. 2008 – June 2017 — New Jersey Education Association (NJEA) Member  
Sep. 2008 – June 2017 — Clearview Regional Education Association Union Member  
Sep. 2006 – Sep. 2008 — Institute of Electrical and Electronics Engineers (IEEE) Member and Journal Subscriber

## Hobbies

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**Reading:** Neuroscience, mathematics, science fiction, history, poetry, biographies, philosophy, high fantasy

**Creative pursuits:** Writing mathematical articles and poetry, drawing, painting

**Fitness:** Running, weight lifting, hiking

**Sports and entertainment:** Attending MLB and NFL games (Orioles, Phillies, Ravens, Eagles), video games, board games

**Leisure and travel:** Exploring restaurants, breweries, wineries; traveling within the U.S. and abroad